

**Economic Analysis
2001-2002 Proposed Capital Project**

**High Pressure Turbine
Dense Pack Modification**

Approximately two years ago, GEC Alsthom came to Intermountain and presented information on a proposed renovation of the high pressure turbines. GE has subsequently also contacted us regarding the same modification.

The proposed modification involves changing the existing double-flow hp nozzle box to a single flow design. By doing this they are able to add stages to the hp turbine and increase hp section efficiency. Both GEC and GE claim to have data from installed units showing an increase in turbine efficiency (decrease in flow to achieve the same output) of at least 2.5%.

The modification will be a turnkey performance contract including pre- and post-installation testing on the hp turbine section for contract validation. The modification includes a technical assessment by GE of the generator (money included for probable cooling system upgrades), an evaluation of the high voltages paths and probable upgrades to the turbine thrust bearing. The design also includes the most efficient type of interstage packing (brush type).

The following economic analysis is provided for both performance benefits and increased generation capacity.

Economic assumptions:

1- Economic life:	20 years (PV of Annuity Factor 11.2)
2- Hours of operation/year:	8340 (8760 - 2.5 weeks ave.outage)
3- Cost of money:	6.35%
4- Cost of generation:	\$27,000/ unit hour (\$30.86/MW hr)
5- Avoided cost of maintenance during 2003 outage:	\$708,000
6- Avoided cost of refurbishing on the hp nozzle:	\$648,000
7- Avoided cost of brush type packing:	\$68,000

Additional Generation Capacity at Existing Steam Flow:

Additional potential revenue
(2.5%)(875MW)(30.86/MW hr)(8340 hrs/yr) = \$5,630,021

Payback: $\frac{\$4,576,000}{\$5,630,021}$ (6,000,000 - items 5,6&7 above) = .8 years

Cost/ Benefit Ratio: $(5,630,021)(11.2)/(4,576,000)$ = 13.8

Heat Rate Improvement at 875MW:

Fuel Savings
(2.5%)(6,300,000lb/hr steam flow)(916 BTU/lb)(1/.88 boiler eff.)(875/830)(1.51/MMBTU) (8760hrs/yr)(0.9cap factor) = \$2,057,533/yr

Total Savings: \$2,057,533 + items 5,6&7 above \$3,481,533

Payback: $\frac{\$4,576,000}{\$3,481,533}$ = 1.3 years

Cost/Benefit Ratio: $(\$3,481,533) (11.2)/(4,576,000)$ = 8.5